

Carbon based Nanomaterials - Processing and Applications

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PLENARY LECTURE

The last few years have witnessed the discovery, development and large-scale manufacturing and production of novel nanomaterials, some of them promise exciting energy and biological related applications. One-dimensional Carbon nanotubes (CNTs) and two-dimensional graphene have outstanding properties, which have sparked an abundance of research since their discovery. These remarkable arrays of features have potential applications as biomedical materials and devices, biosensors, drug and vaccine delivery vehicles and novel biomaterials. In addition, they promise a wide range of energy applications such as catalyst supports in fuel cells, electronic devices, field emitters, gas sensors, gas-storage media, supercapacitors, nanofluids and molecular wires for next generation electronic devices. Use of nanomaterials, nanoparticles and nanocomposites for biomedical purposes constitutes nanomedicine and CNTs have been poised to revolutionise a variety of biomedical applications. The *in vivo* toxicological and pharmacological studies undertaken so far indicate that functionalised carbon nanotubes can be developed as nanomedicines. Functionalisation renders the surface of carbon nanotubes water soluble, compatible with biological fluids and leads to their rapid excretion through the renal route and minimising unwanted tissue accumulation. Many approaches to nanomedicine being pursued today are already close enough to fruition that their subsequent incorporation into valuable medical diagnostics is highly likely to occur very soon. In the longer term,

nanorobots may join the medical giving physicians the most potent tools imaginable to conquer human disease.

The present talk offers a concise and focused review of the state-of-the-art in the synthesis of different types of nanomaterials and their properties. In addition, the processing of Carbon nanotubes and graphene and their applications will be addressed taking into consideration of the various key issues for the development of environmental, energy materials and nanomedicines.